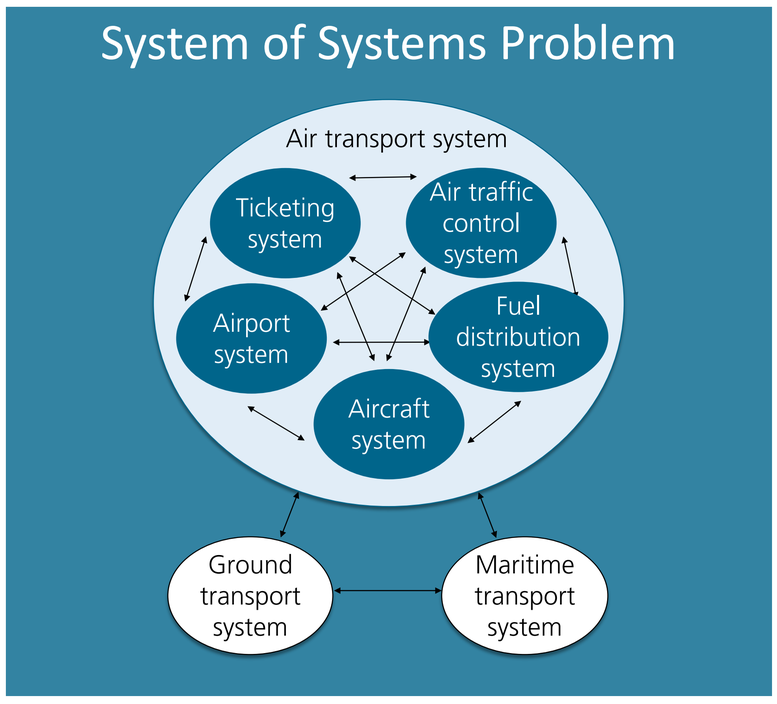
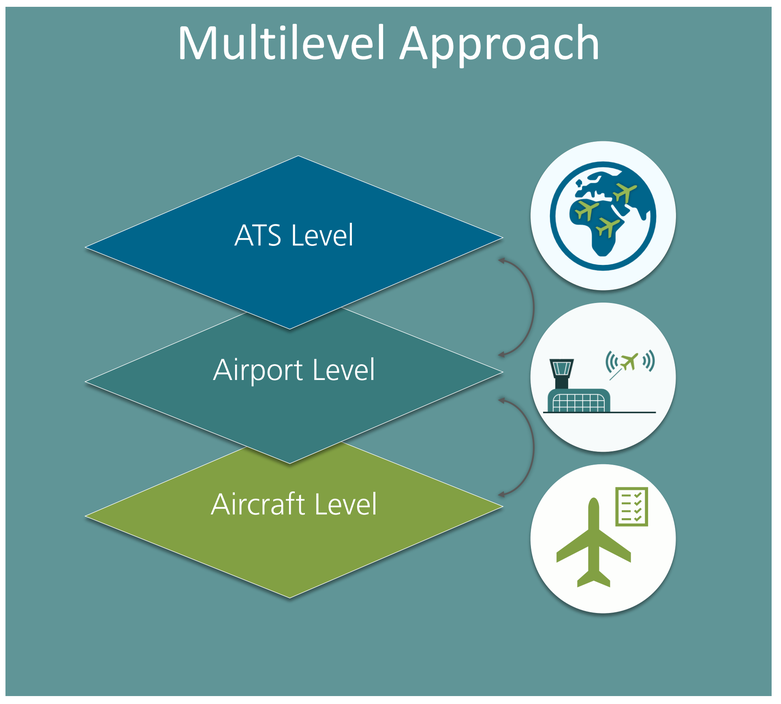
#ArchitectingAviation

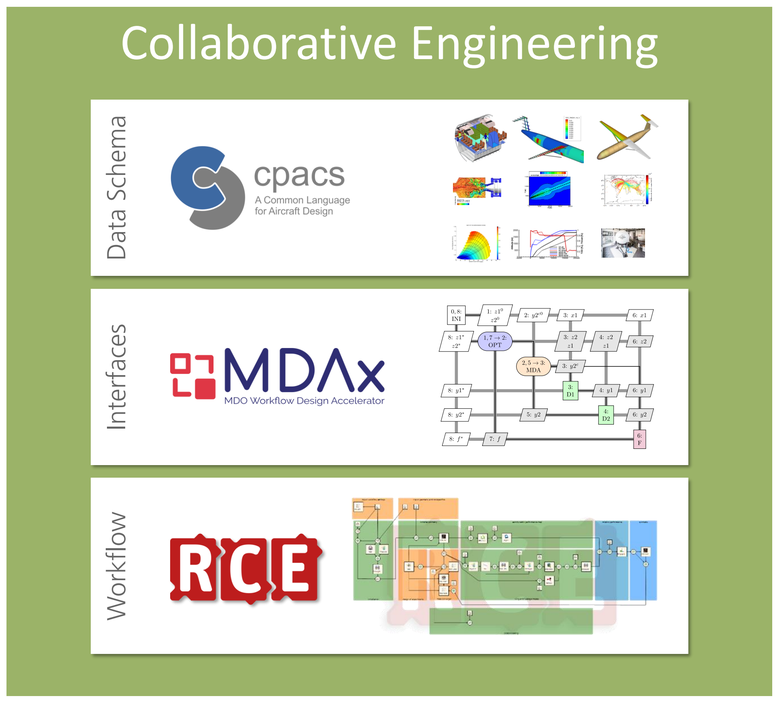
Workflow Demonstration for Impact Assessment Studies

Integrating Multi-Domain Use Cases in Automated Impact Assessment Workflows for Aircraft, Airport and Air Transport System Level Studies

Overview and Approach





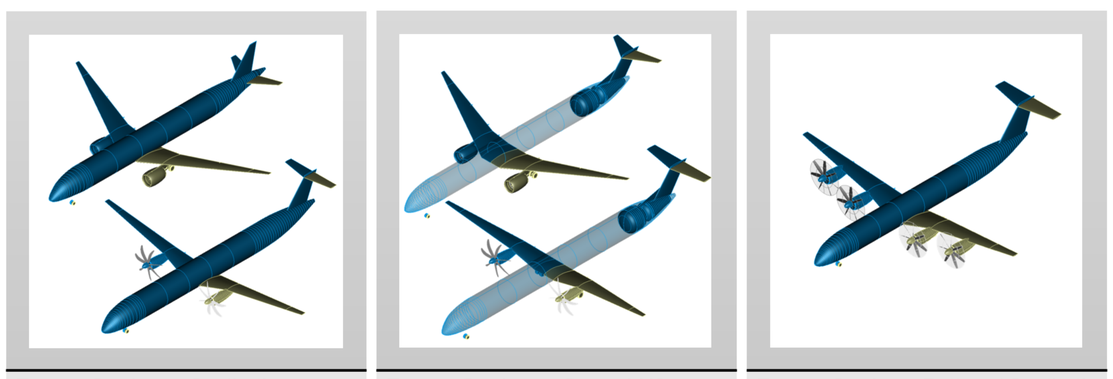


Collaborative Engineering

For a holistic impact assessment, collaborative engineering tools enable multi-disciplinary, distributed and automated workflows. CPACS (Common Parametric Aircraft Configuration Schema) standardizes data exchange, MDAx supports multi-disciplinary interface and workflow design, and RCE (Remote Component Environment) integrates and automates the workflow execution.

Aircraft Level

The framework integrates aircraft data from the EXACT project for economical and ecological impact assessment. New engine maps from aircraft design support noise analysis, while aerodynamic performance data enables emission calculations with 2D trajectory modeling, ensuring scalable aircraft assessments on airport and Air Transport System (ATS) level level.



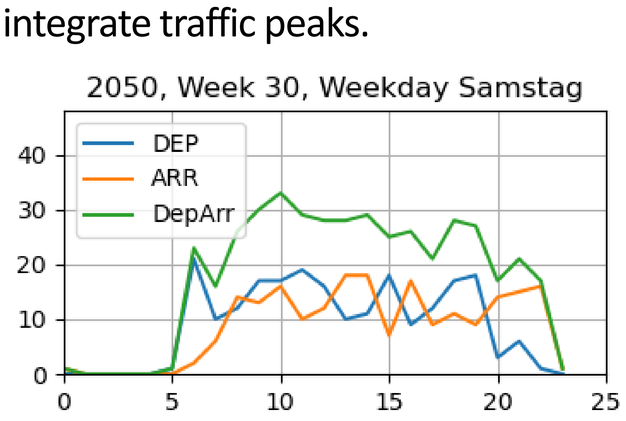
Energy Carrier	Synthetic Kerosene	Energy Carrier	Green LH2	Energy Carrier	Battery / Synthetic Kerosene
Propulsion Architecture	Mild-Hybrid	Propulsion Architecture	Mild-Hybrid	Propulsion Architecture	Plug-In-Hybrid
Main Power Provider	Gas-Turbine	Main Power Provider	Gas-Turbine	Main Power Provider	Battery / Electric Motor
Off design Power Provider	Solid-Oxide Fuel-Cell	Offdesign Power Provider	PEM Fuel-Cell	Offdesign Power Provider	Gas-Turbine

Figure 1: Available Aircraft Concepts from EXACT

Airport Level

Airport level assessment uses data from ATS level to break down demand and fleet forecasts per airport. Daily flight schedules enable micro-level research, crucial for innovative propulsion technologies affecting turnaround times, utilization, and lifespan.

Detailed schedules also support ground handling and future infrastructure planning. The schedules distinguish between summer- and winter schedules and weekdays to be able to illustrate and integrate traffic peaks.



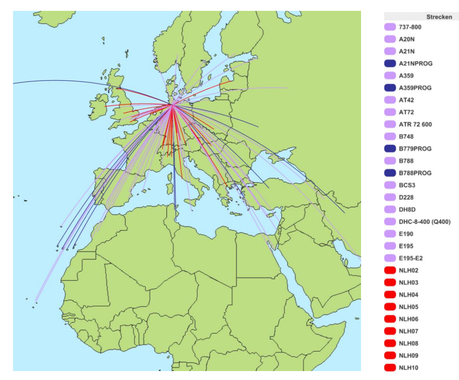


Figure 2: Illustrative Airport Level Forecast in 2050

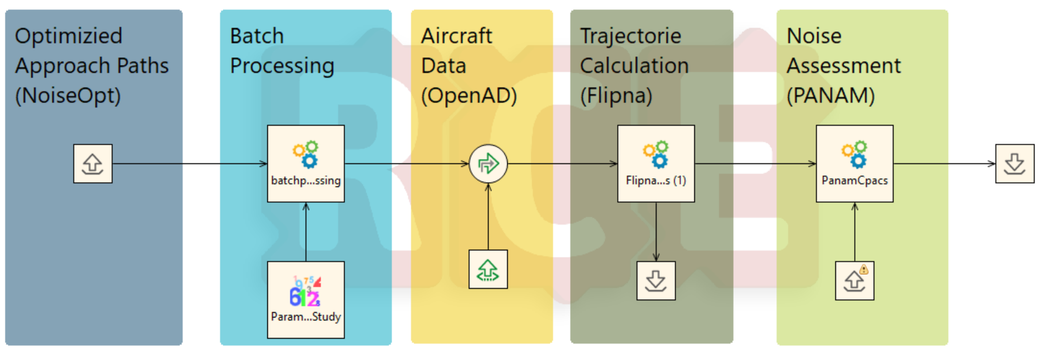


Figure 3: Airport Level Noise Assessment Workflow in RCE

Air Transport System Level

ATS-level assessment connects aircraft missions to a global fleet perspective. Aircraft-level data is provided to the Scheduler, which generates global flight plans and forecasts fleet evolution. These flight plans are input for GRIDLAB, where aircraft trajectories are processed to create a global emission inventory, which AirClim evaluates for climate impact in terms of temperature increase and derived climate metrics. This ensures a consistent, automated assessment from aircraft level to a global ATS Level.

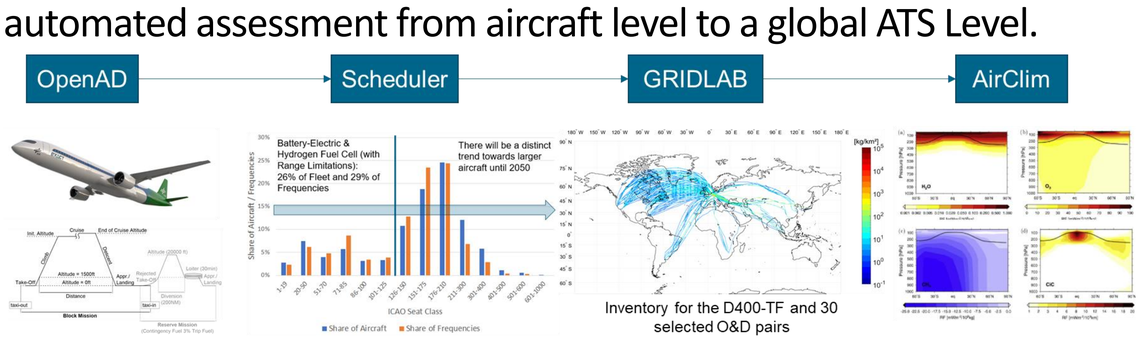


Figure 4: Schematic ATS Level Emission and Climate Impact Assessment Workflow

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